STREAMBANK AND SHORELINE PROTECTION (FEET)

CODE 580

MONTANA TECHNICAL GUIDE **SECTION IV**

DEFINITION

Treatment(s) used to stabilize and protect banks of streams or constructed channels, and shorelines of lakes, reservoirs, or estuaries.

PURPOSE

- To prevent, **control, or minimize** the loss of land or damage to land uses, or other facilities adjacent to the banks, including the protection of known historical, archeological, and traditional cultural properties.
- To maintain the flow or storage capacity of the water body or to reduce the offsite or downstream effects of **excessive** sediment resulting from bank erosion.
- To improve or enhance the stream corridor for fish and wildlife habitat, aesthetics, recreation.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to streambanks of natural or constructed channels and shorelines of lakes, reservoirs, or estuaries where they are susceptible to erosion. It applies to controlling erosion where the problem can be solved with relatively simple structural measures **(as shown in the Engineering Field Handbook, Chapter 16, Part 650, Section 650.1601–Streambank Protection)** vegetation **(herbaceous or woody)**, or upland erosion control practices. It does not apply to erosion problems on main oceanfronts and similar areas of complexity not normally within the scope of NRCS authority or expertise.

CRITERIA

General Criteria Applicable to All Purposes

Measures must be installed according to a site-specific plan and in accordance with all applicable local, state, and federal laws and regulations.

Protective measures to be applied shall be compatible with improvements planned or being carried out by others.

Protective measures shall be compatible with the bank or shoreline materials, water chemistry, channel or lake hydraulics, and slope characteristics both above and below the water line.

End sections shall be adequately bonded to existing measures, terminate in stable areas, or be otherwise stabilized.

Protective measures shall be installed on stable slopes. Bank or shoreline materials and type of measure installed shall determine maximum slopes.

Designs will provide for protection from upslope runoff.

Internal drainage for bank seepage shall be provided when needed. Geotextiles or properly designed filter bedding shall be used on structural measures where there is the potential for migration of material from behind the measure.

Measures planned shall not adversely affect threatened and endangered species nor species of special concern as defined by the **Montana Natural Heritage Program** and federal agencies. **If threatened and endangered species or their critical habitats are present at the site, or**

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This type of font (AaBbCcDdEe 123..) indicates Montana Supplement.

downstream, or upstream, General Manual (GM) 190 ECS, Part 410.22 and Montana Field Office Technical Guide (FOTG), Section I, General Resource References, Threatened and Endangered Species shall be followed.

Measures shall be designed for anticipated ice action and fluctuating water levels.

All disturbed areas around protective measures shall be protected from erosion. Disturbed areas that are not to be cultivated shall be protected as soon as practical after construction. Vegetation shall be selected that is best suited for the soil/moisture regime.

Additional Criteria for Streambanks

The channel grade shall be stable based on a field assessment **(Rosgen's "A Classification of Natural Rivers," 1996; and/or, a channel evolution model, Schumm et al. 1984, or Simon 1989)** before any permanent type of bank protection can be considered feasible, unless the protection can be constructed to a depth below the anticipated lowest depth of streambed scour.

A protective toe shall be provided based on an evaluation of stream bed and bank stability.

Channel clearing to remove stumps, fallen trees, debris, and bars shall only be done when they are causing or could cause detrimental bank erosion or structural failure. Habitat forming elements that provide cover, food, pools, and water turbulence shall be retained or replaced to the extent possible.

Changes in channel alignment shall not be made unless the changes are based on an evaluation that includes an assessment of both upstream and downstream fluvial geomorphology. The current and future discharge-sediment regime shall be based on an assessment of the watershed above the proposed channel alignment.

Measures shall be functional for the design flow and sustainable for higher flow conditions based on acceptable risk.

Measures shall be designed to avoid an increase in natural erosion downstream.

Measures planned shall not limit stream flow access to the floodplain.

Stream segments to be protected shall be classified according to a system deemed appropriate by the state. **In Montana, Rosgen's "A Classification of Natural Rivers," 1996; and/or, a channel evolution model, Schumm et al. 1984, or Simon 1989 shall be used.** Segments that are incised or contain the 5-year return period (20 percent probability) or greater flows shall be evaluated for further degradation or aggradation.

When water surface elevations are a concern, the effects of protective measures shall not increase flow levels above those that existed prior to installation.

Vegetation selected shall be according to the Montana Field Office Technical Guide (FOTG), Section IV, Practice Standards and Specifications, 322–Channel Vegetation.

Additional Criteria for Shorelines

All revetments, bulkheads, or groins are to be no higher than 3 feet (1 meter) above mean high tide, or mean high water in non-tidal areas.

Structural shoreline protective measures shall be keyed to a depth to prevent scour during low water.

For the design of structural measures, the site characteristics below the waterline shall be evaluated for a minimum of 50 feet (15 meters) horizontal distance from the shoreline measured at the design water surface.

The height of the protection shall be based on the design water surface plus the computed wave height and freeboard. The design water surface in tidal areas shall be mean high tide.

When vegetation is selected as the protective treatment, a temporary breakwater shall be used during establishment when wave run up would damage the vegetation.

Additional Criteria for Stream Corridor Improvement

Stream corridor vegetative components shall be established as necessary for ecosystem functioning and stability. The appropriate composition of vegetative components is a key element in preventing excess long-term channel migration in re-established stream corridors.

Measures shall be designed to achieve any habitat and population objectives for fish and wildlife species or communities of concern as determined by a site-specific assessment or management plan. Objectives are based on the survival and reproductive needs of populations and communities, which include habitat diversity, habitat linkages, daily and seasonal habitat ranges, limiting factors and native plant communities. The type, amount, and distribution of vegetation shall be based on the requirements of the fish and wildlife species or communities of concern to the extent possible.

Measures shall be designed to meet any aesthetic objectives as determined by a site-specific assessment or management plan. Aesthetic objectives are based on human needs, including visual quality, noise control, and microclimate control. Construction materials, grading practices, and other site development elements shall be selected and designed to be compatible with adjacent land uses.

Measures shall be designed to achieve any recreation objectives as determined by a site-specific assessment or management plan. Recreation objectives are based on type of human use and safety requirements.

CONSIDERATIONS

An assessment of streambank or shoreline protection needs should be made in sufficient detail **(See Montana Engineering Practice Planning and Design for Stream Channel Stabilization/ Streambank Protection)** to identify the causes contributing to the streambank or shoreline instability (e.g. watershed alterations resulting in significant modifications of discharge or sediment production). Due to the complexity of such an assessment an interdisciplinary team should be utilized.

When designing protective measures, consider the changes that may occur in the watershed hydrology and sedimentation over the design life of the measure.

Consider utilizing debris removed from the channel or streambank in the treatment design.

Use construction materials, grading practices, vegetation, and other site development elements that minimize visual impacts and maintain or complement existing landscape uses such as pedestrian paths, climate controls, buffers, etc.

Avoid excessive disturbance and compaction of the site during installation.

Utilize vegetative species that are native and/or compatible with local ecosystems. Avoid introduced or exotic species that could become nuisances. Consider species that have multiple values such as those suited for biomass, nuts, fruit, browse, nesting, aesthetics and tolerance to locally used herbicides. Avoid species that may be alternate hosts to disease or undesirable pests. Species diversity should be considered to avoid loss of function due to species-specific pests. Species on noxious plant lists should not be used.

Livestock exclusion should be considered during establishment of vegetative measures and appropriate grazing practices applied after establishment to maintain plant community integrity. Wildlife may also need to be controlled during establishment of vegetative measures. Temporary and local population control methods should be used with caution and within state and local regulations.

Measures that promote beneficial sediment deposition and the filtering of sediment, sediment-attached, and dissolved substances should be considered.

Consider maintaining or improving the habitat value for fish and wildlife, including lowering or moderating water temperature, and improving water quality.

Consideration should be given to protecting side channel inlets and outlets from erosion.

Toe rock should be large enough to provide a stable base and graded to provide aquatic habitat.

For additional erosion control, shade, reduced water temperature, and fish habitat consider adding woody vegetation or other bioengineering measures near the toe of structural practices.

Consider maximizing adjacent wetland functions and values with the project design and minimize adverse effects to existing wetland functions and values.

When appropriate, establish a buffer strip and/or diversion at the top of the bank or shoreline protection zone to help maintain and protect installed measures, improve their function, filter out sediments, nutrients, and pollutants from runoff, and provide additional wildlife habitat.

Consider conservation and stabilization of archeological, historic, structural and traditional cultural properties when applicable.

Measures should be designed to minimize safety hazards to boaters, swimmers, or people using the shoreline or streambank.

Protective measures should be self-sustaining **(integrating soil bioengineering with structural measures)** or require minimum maintenance.

PLANS AND SPECIFICATIONS

Plans and specifications for streambank and shoreline protection shall be prepared for specific field sites and based on this standard and shall describe the requirements for applying the practice to achieve its intended purpose. **Procedure shall be in keeping with the Montana Engineering Practice Planning and Design Guide for Stream Channel Stabilization/Streambank Protection located in the NRCS, Montana Supplement to the Engineering Field Handbook.**

OPERATION AND MAINTENANCE

An operation and maintenance plan shall be prepared for use by the owner or others responsible for operating and maintaining the system. The plan shall provide specific instructions for operating and maintaining the system to insure that it functions properly. It shall also provide for periodic inspections and prompt repair or replacement of damaged components or erosion.

REFERENCES

Montana Natural Heritage Program—*http://nris.state.mt.us/mtnhp/index.html.*

Rosgen, D.L. 1996. Applied river morphology. Wildland Hydrology, Colorado.

Schumm, S.A., M.D. Harvey, and C.C. Watson. 1984. Incised channels: morphology, dynamics, and control. Water Resources Publications, Littleton, Colorado.

Simon, A. 1989a. A model of channel response in distributed channels. Earth Surface Processes and Landforms 14(1): 11-26.

USDA–Natural Resources Conservation Service, General Manual (GM) 190 ECS, Part 410.22.

USDA–Natural Resources Conservation Service, Field Office Technical Guide, Section I–General Resource References, Threatened and Endangered Species.

USDA–Natural Resources Conservation Service, Field Office Technical Guide, Section IV–Practice Standards and Specifications:

- 322–Channel Vegetation, September 1999.
- 584–Stream Channel Stabilization, July 1989.

USDA–Natural Resources Conservation Service, Engineering Field Handbook (Montana Supplement), Part 650/Book I.

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Conservation practice standards are reviewed periodically and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.